GENERIC SPECIFICATION FOR TRANSIENT RECORDER AND POWER METER WITH ADVANCED POWER QUALITY AND COMMUNICATION
Nexus® 1500 Meter

2. PRODUCT

2.1 Power Meter

A. The meter shall be UL listed and CE marked.

B. The meter shall be designed for multifunction electrical measurement on 3 phase power systems.

1. The meter shall support 3-element Wye, 2.5 element Wye, 2 element Delta, and 4-wire Delta systems.
2. The meterôs surge withstand shall conform to IEEE C37.90.1 and ANSI C62.41 (6kV).
3. The meter shall be user programmable for voltage range to any CT or PT ratio.
4. The meter shall have a voltage burden of not more than 0.072VA per phase Max at 600V, and 0.003VA per phase Max at 120 Volts.
5. The meter shall have a current inputs burden of not more than 0.008VA per phase Max at 20 Amps.
6. The meter shall accept a voltage input range of up to 347VAC Line to Neutral, and a range of up to 600VAC Line to Line.
7. The meter shall accept a current reading of up to 20 Amps continuous. Start up current for a 5 Amp input shall be no greater than 0.005 Amps.
8. The meter shall provide time-stamped maximum and minimum readings for every measured parameter.
9. The meter shall provide coincident VAR readings for all maximum Watt readings with time/date stamp.

C. The Power meter shall use a dual input method for current inputs. Method one shall allow the CT to pass directly through the meter without any physical termination on the meter, ensuring the meter cannot be a point of failure on the CT circuit. The second method shall provide additional termination pass-through bars that allow the CT leads to be terminated on the meter.

1. The Fault Current Withstand shall be 100 Amps for 10 seconds, 300 Amps for one second.
2. The Pass-through wire gauge dimension of 0.177ò / 4.5 mm shall be available.
3. All inputs and outputs shall be isolated to 2500 Volts AC.

D. Power meter shall measure and report the following quantities at a minimum:

1. Watts (total and per phase), VARs (total and per phase), VA (total and per phase), Power Factor (total and per phase), and Frequency. 200 milliseconds and one- second readings shall be available simultaneously. Readings shall be available for both metering and control. All specified readings shall be made available through the meterôs standard and optional communication ports.
2. Accumulated Watt-hr, VA-hr, and VAR-hr; Watt-hr received; Watt-hr delivered. VAR-hr and VA-hr reading shall be accumulated and stored for each of the 4 quadrants of power.
3. Power demand shall be simultaneously calculated using five different averaging methods: Fixed Window (Block) Average, Sliding Window (Rolling Block) Average, Thermal Average, Predicted Average, and Cumulative Demand. Values for all averaging intervals must be available simultaneously.
4. Fixed Window (Block) Average interval shall be user-settable from one-second to 18 hours. Sliding Window (Rolling Block) Average sub-interval shall be user-settable from one-second to 18 hours. The number of intervals in the Sliding Window (Rolling Block) Average shall be user-settable from one to 255 sub-intervals.

E. The power meter shall compensate for errors in current transformer and potential transfers.

1. Errors shall include voltage, multipoint current, multiphase angle, and better than .01% resolution.
2. The unit shall utilize five different current compensation points per phase.

F. Power meter shall provide the following accuracies. Accuracies shall be measured as percent of reading at standard meter test points.

1. Power meter shall meet ANSI C12.20 for Class 0.2 and IEC 687 accuracy requirements.
2. Voltage accuracy shall be within less than 0.05% for the 1-second readings and less than 0.1% for 200-millisecond readings.
3. Current accuracy shall be within less than 0.025% for the 1-second readings and less than 0.1% for 200-millisecond readings.
4. Frequency shall have a display resolution accuracy of less than 0.001 Hz.

G. Auto-calibration components shall include:

1. Precision internal references with real-time auto calibration for voltage and current channels.

2. An internal temperature sensor that to allow to recalibrate the meter upon change of temperature in real time while under operation.

H. Power meter shall include upgrade packs, which shall allow user to upgrade in-field without removing installed meter.
1. The three upgrade packs shall be:
    a. V1 - Standard Nexus® 1500 meter with 128 MegaBytes memory and 512 samples per cycle.
    b. V2- V1 plus 1 Gigabyte memory and 1024 samples per cycle.
    c. V3 - V2 plus 10MHz Transient recording.

I. Meter shall include an integrated 5.7-inch touch screen TFT LCD color display with multiple display modes.
1. Display shall support 4 groups of screens: Real Time, Trending, Alarms, and Power Quality modes.
2. Groups of screens shall include:
    a. Real Time viewing of voltage, current, power, demand
    b. Accumulated Energy and Time of Use readings
    c. Flicker readings in Instantaneous, Short Term (PST), and Long Term (PLT)
    d. Alarm conditions
    e. Phasor analysis
    f. Harmonic spectrum analysis and waveform scopes for both voltage and current
    g. Real Time trending
    h. Log status
    i. Configuration settings.
3. The Display shall be constructed of bright TFT glass with a high temperature and long-life LED backlight. CCFL backlight shall not be acceptable.
4. The meter shall have two infrared accuracy test pulses on the meter front.

J. Power meter shall provide multiple digital communication ports and support multiple open protocols:
1. Meter shall include an ANSI Optical port for communication to external devices that supports speeds of up to 57,600 bps.

2. Meter shall have one standard 10/100BaseT Ethernet port. Ethernet port shall allow for 8 simultaneous connections.
3. Meter shall have a second optional Ethernet port. Optional Ethernet port shall be available as either 10/100BaseT or 10/100Base-FX Fiber Optic configuration.
4. Meter shall have two (2) optional RS485 ports through Dual Pulse Output/RS485 card. The card shall have 4 user-programmable KYZ pulse outputs. Each RS485 port shall be user configurable with regard to speed, protocol, address, and other communications parameters. All Ports shall support a minimum communication speed of up to 115k baud simultaneously and be assignable for Modbus or DNP 3.0 communication.
5. Meter shall have a High-speed USB port mounted on the front panel.
6. Meter shall communicate using Modbus RTU, Modbus ASCII, DNP 3.0 Modbus TCP/IP, and DNP over Ethernet protocols as standard configurations. all instantaneous data, logged data, event data, power quality analysis and waveform information shall be available using these open protocols. The meter shall also provide means for custom modbus mapping.
7. Meter shall include DNP 3.0 protocol utilizing a level 2 implementation for communication to SCADA systems. All instantaneous data and average data shall be available using DNP 3.0 protocol. User shall be able to custom map data into DNP protocol using Windows based Communicator EXT software.

K. The meter shall have Output expandability through four Option card slots on the meterôs back and through optional External Output modules.

1. The Option cards shall be capable of being installed in the field, without removing the meter from installation.
2. The meter shall auto-detect the presence of any Option cards.
3. The available Option cards shall be:
    b. Dual RS485/Pulse Output card
    c. Ethernet card with RJ45 or Fiber Optic port
    d. Up to two Relay Output cards with 6 output relays on each card
    e. Up to two Digital Input Status cards with 16 inputs on each card
4. Meter shall have optional External Output Modules in the following configurations:
    - Meter shall support up to 4 Analog Output Modules in 0-1mA or 4-20mA, in either 4 or 8 analog output models
    - Meter shall support up to 1 Digital Dry Contact Relay Output Module, with 4 relay outputs
    - Meter shall support up to 4 Digital Solid State Pulse Outputs modules for KYZ pulsing

- External Output modules shall be powered by external power source and attached to the meter with mounting brackets

L. The meter shall internally record and store Time of Use data.

1. The following Time of Use parameters must be included:
    a. Bi-directional consumption and demand
    b. Eight (8) TOU Schedules
    c. Twenty (20) Year Calendar
    d. Four (4) seasons per year.
2. The meter must provide the following TOU information for all rates in real-time:
    a. Current month accumulations
    b. Previous month accumulations
    c. Current season accumulations
    d. Previous season accumulations
    e. Total accumulations to date
    f. Programmable Freeze Registers
    g. Cumulative Demand.
3. Full four quadrant accumulations for Watt-hr, VAR-hr, VA-hr and coincident VARs during peak watt demand including max demand, shall be available for each rate schedule, each season and for total accumulations.

M. Meter shall have eight built-in digital high-speed status inputs:

1. Inputs shall automatically sense when the circuit is externally wetted.
2. If externally wetted, inputs shall accept up to 300VDC; if internally wetted the meter shall supply the necessary voltage for the control application.
3. Status inputs shall be configurable for pulse accumulation, pulse synchronization, or event monitoring. When used for pulse accumulation, each input shall have an accumulating register to count incoming pulses.
4. All changes in status shall be time stamped to the nearest millisecond and placed in an event log with time and event label information.
5. Event log shall enable users to recreate sequence of events involving external status points.
6. High-speed status inputs shall be able to trigger waveform recording to the waveform log.

N. Meter shall enable users to perform Flicker analysis and shall comply fully with the Flicker requirements of EN61000-4-15 and EN61000-4-30 Class A requirements.

1. The unit shall provide users with logging and monitoring for Instantaneous, Short term readings (PST-10min) and Long term readings (PLT-4 hour).
2. Meter shall provide users with the ability to perform comprehensive analysis by viewing Inter-harmonics, the further frequencies between the harmonics of the power frequency voltage and current.
3. Flicker shall support both 220Volt/50Hz systems and 120Volt/60Hz systems.

O. Meter shall have 16-bit Waveform and Fault Recorder.

1. Meter shall record up to 1024 samples per cycle and transient captures sensitive to at least 166,000 samples per cycle.
2. Meter shall perform voltage and current recording with pre- and post-event analysis when a waveform limit is exceeded. Pre and post event shall be configurable to up to 30 cycles pre- and up to 300 cycles post-event.
3. Fault recording shall offer 8 times full scale capture capability.
4. The meter shall allow viewing of Harmonic magnitudes to the 512^{th} order. Real time Harmonic magnitudes shall be resolved to the 128^{th} order.
5. Percent THD and K-factor shall be calculated by the meter.
6. The meter shall have the capability to record up to 1024 samples per cycle continuously on all 8 channels simultaneously. Up to 1000 megabytes can be allocated for storage of recorded waveform samples.

P. With upgrade pack 3, the meter shall have a sub-cycle Transient recorder.

1. The transient recorder shall process 10MHz high-speed voltage transients by over-sampling at a 55MHz sampling rate.
2. Transient will be analyzed utilizing an FPGA (field programmable gate array to designate the high peak transient magnitude and its duration in Nanoseconds.
3. The meter shall have the capability to resolve transient duration to as low as 20 nanoseconds.

Q. Power meter shall be equipped with extensive non-volatile memory for recording logs and programming information.

1. Meter shall include at least 1000 megabyte of non-volatile storage.
2. Equipped with 1 Gigabyte of memory, the meter shall be able to store 800 files or a total of 800 Megabytes in logs.

3. Meter shall store historical trending data, power quality data, and waveform recordings in memory.
4. In the event of loss of control power, data stored in memory shall be retained for at least 10 years.
5. Memory shall be allocated to the various logging functions required. All logging features required shall be simultaneously available at the specified levels. Exercising any one feature at the specified level shall not limit exercising of any or all other features to their full, specified level.

R. Power meter shall provide multiple memory logs to bring back historical, alarm, waveform, and system event data.

1. Power meter shall have up to eight historical logs. Each historical log shall be user configurable, and the user can allot the amount of memory for each log. User may select up to 128 parameters per log.
2. The meter shall have a log for Limits Alarms. The Limits log shall provide magnitude and duration of an event, time-stamp, and log value.
3. The meter shall have a log for System Events. The System Events log shall record the following occurrences with a time-stamp: Demand Resets, Password Requests, System Startup, Energy Resets, Log Resets, Log Reads, and Programmable Settings Changes.
4. The meter shall have a log for High-speed Input status changes.
5. The meter with Upgrade packs 3 shall have a log which is capable of recording a waveform both when a user-programmed value goes out of limit and when the value returns to within limit.
6. The meter shall store a separate ITIC/CBEMA log that records magnitude and duration of voltage and current surges and sags for every power quality event. The CBEMA log shall be downloadable through the digital communications ports.

S. Power meter shall provide waveform recording to capture and record transients and quality problems on current and voltage waveforms.

1. Meter shall sample waveforms at a user configurable rate of 16 to 1024 samples per cycle (60Hz cycle). Up to seven channels shall be available for waveform recording.
2. At the lowest sampling rate of 16 samples per cycle in a 60Hz system, the meter shall be able to record more than 7900 records, with each record containing 180 cycles of data from seven channels: over 1,400,000 cycles total. At the highest sampling rate, each waveform record shall contain 40 cycles of data.
3. Meter shall include a user-programmable setting to establish the number of records captured per trigger event for all sample rates below 1024 samples per

cycle. Meter shall be able to capture from 1 to the maximum number of records for any trigger event at any sample rate below 1024 samples per cycle. Meter shall be able to record up to 1,400,000 cycles in response to a single event trigger.

4. Each waveform record shall include pre-event and post-event data.
5. Waveforms shall be recorded with time resolution to within five milliseconds.
6. A waveform record shall be taken whenever the RMS value of voltage or current exceeds user-set limits.
7. User shall be able to configure meter so that a waveform record shall be taken whenever a status change occurs on any one of the eight high-speed status inputs.

T. Power meter shall provide a separate IRIG-B input for time synchronizing to GPS time signal.

1. IRIG-B input shall accept un-modulated time signal input from a standard GPS satellite clock.
2. Time input shall enable synchronizing of meter time to within one millisecond of Universal Standard Time as transmitted by the GPS clock system. Synchronizing shall not be subject to network or other delays.

U. Power meter shall be programmable by software supplied by the meter manufacturer.

1. Software shall have a user-friendly, Windows compatible interface.
2. Software shall operate on Windows 2003 Server, Windows 2008 Server, Windows XP Pro, Windows VISTA Business or Ultimate, and Windows 7 operating systems.
3. Software shall include capacity to program meter, download meter, and analyze downloaded data files.
4. Software shall store all data in an ODBC compliant database. Data based storage shall include all log and waveform data.

V. Power meter shall provide Limits Alarms and Control Capability as follows:

1. Limits can be set for any measured parameter.
2. Up to 32 limits can be set.
3. Limits shall be based on % of Full Scale settings.
4. Manual Relay Control shall be available through software.
5. Relay set delays and reset delays shall be available.

W. Power meter shall be appropriately constructed to provide long life in abusive physical and electrical environments.

1. Meter firmware shall be held in flash RAM and shall be upgradeable through one of the communications port without removing the unit from service.
2. Meter shall operate successfully at temperature extremes from ï 20^{o} C to +70^{o} C.
3. Depending on ordered option, meter shall operate with control power from either (100-240)VAC or (90-265)VAC@50/60Hz or (100-370)VDC.
4. Meter shall have a standard 4-year warranty.

X. Power meter shall be Electro Industries/GaugeTech model: Nexus® 1500 meter. The part number is:

Nexus 1500 - D2 - 60Hz - V3 - 485P - NTFO - 6RO1 - 6RO1

No substitutes allowed.

For complete specification information, contact Electro Industries/GaugeTech at:

Electro Industries/GaugeTech
1800 Shames Drive
Westbury, NY 11590
Phone: 516-334-0870
Fax: 516-338-4741
www.electroind.com